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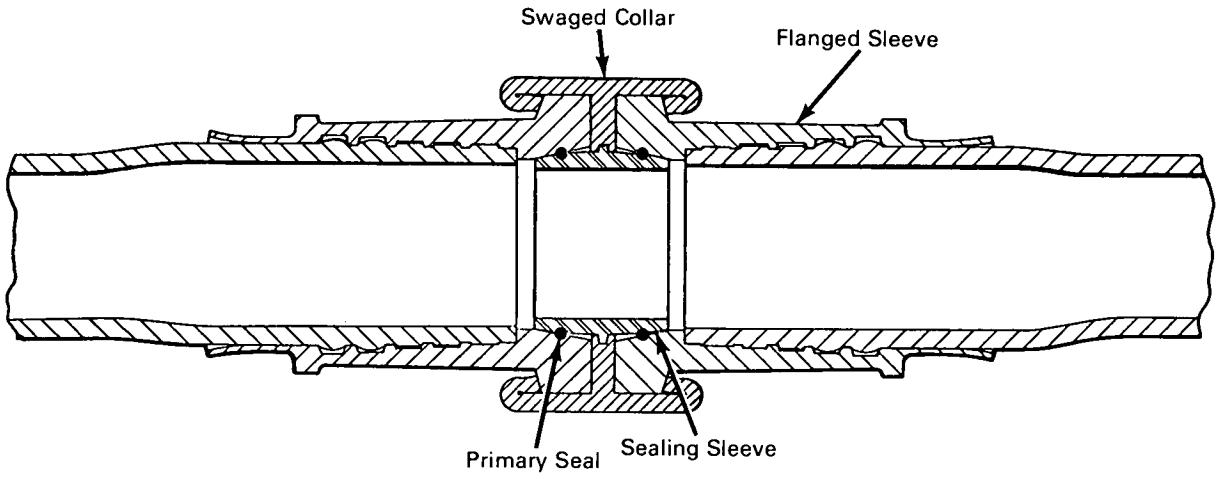
NASA TECH BRIEF

X-Connectors for Tubing: Feasibility Study



Assembled X-Connector; 0.5-in. Tubing

The production design of lightweight 0.5-in. X-connectors (see fig.) for 4500-lb/in^2 service pressures is feasible (see Note). This conclusion is based on the results of the following tests of 26 connectors: 70°F leakage, proof pressure, vibration at 70°F, burst pressure, tensility, long-term leakage at 70°F, thermal shock, high and low temperature leakage, and simultaneous high temperature vibration and leakage.

In development of the production design, special attention should be given to the resistance to vibration and the sealing integrity of the tube-to-sleeve swaging; in these tests this swaging was the only element that showed faults. This swaging problem is probably not insurmountable; imperfections during the tests resulted from correctable flaws, self-healing leaks, or poor monitoring of environmental conditions.

The primary concern in the future should be the necessary depth of swaging and the distribution of that depth. The sealing ability of the joint increases with increase in that depth, but the structural integrity of the joint increases only up to some optimum depth. Shallower swaging makes the tube subject to axial pullout; greater depth weakens the tube's material and makes it subject to cracking under bending loads. All-around uniformity of depth of swaging is obviously desirable, as is the design of the sleeve's cross section for maximum resistance to failure. In this study, the axial distribution of the depth of swaging was such that the possibility of tube pullout was minimized; each contact ring should take an equal share of the tensile load. Axial variation in the sleeve's thickness and diameter provides a similar opportunity for apportionment of the bending load between contact rings; cost and leakage possibilities must be kept in mind in any such attempt.

The variable parameters in trial-and-error design of a tube-to-sleeve swaging tool should be (1) curvature of the swaging collets, which affects radial

(continued overleaf)

distribution of contact penetration of the tube's material; (2) the shapes of the restraining collar and the connector sleeve, which affect axial distribution of the penetration; and (3) tool turns during forming, which affect average depth of the penetration. Portability of the swaging tools should be emphasized.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price $3.00
(or microfiche $0.65)

Reference:

NASA-CR-93923 (N68-20977), Zero Leakage Design for Ducts and Tube Connections for Deep Space Travel: X-Connector Feasibility Studies

Patent status:

No patent action is contemplated by NASA.

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